DOCUMENT RESUME

ED 234 287 CG 016 881

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TITLE A Factor Analytic Study of the Beck Depression Inventory for Female College Students.
PUB DATE Apr 83
NOTE 18p.; Paper presented at the Annual Meeting of the Southwestern Psychological Association (29th, San Antonio, TX, April 21-23, 1983).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *College Students; *Depression (Psychology); Emotional Problems; Factor Analysis; *Factor Structure; *Females; Higher Education; Individual Differences; Psychological Evaluation; Self Concept; *Sex Differences; Student Characteristics
IDENTIFIERS *Beck Depression Inventory

ABSTRACT

Previous factor studies of the Beck Depression Inventory (BDI) have not analyzed the item data as a function of sex, or reported more than one factor solution. To further study the factor structure of the BDI, items were factor analyzed and multiple solutions were examined for simple structure, parsimony, and psychological meaningfulness. A sample of 164 female college students who participated in a series of studies dealing with depression, sentence comprehension, and memory completed the BDI. A secondary series of analyses were computed for the higher scoring (more depressed) students. As expected, the first analysis yielded one general factor indicating, primarily, the depth of depression. However, four factors were interpreted in the secondary analysis with more depressed students. The composition of the resultant factors (guilty depression with sadness, pessimistic outlook and sense of failure, social withdrawal, and health concern) was not similar to those observed in previous studies which showed the factors guilt, depression, retardation, and self-deprecation. Compared to other samples with a mixed population, the incidence of depressive symptoms was higher in the present sample. Male BDI data, when similarily analyzed and compared to the female findings, will provide a better idea about the relation of sex to the factor structure of the BDI with college student populations. (JAC)

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ED234287

A Factor Analytic Study of the Beck Depression Inventory for Female College Students

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Paper presented at the meeting of the Southwestern Psychological Association, San Antonio, Texas, April 1983.

Abstract

The Beck Depression Inventory (BDI) was factor analyzed for 164 female college students and one general factor emerged as expected. However, four factors were interpreted in a secondary analysis using the item data from those females with BDI scores of 10 or higher. The composition of the resultant factors was not similar to those observed in the previous clinical literature. Compared to other samples, the incidence of depressive symptoms was higher in the present sample. These results suggest important implications for psychological deficit research using college student populations.

A Factor Study of the Beck Depression Inventory with Female College Students[1]

The purpose of the present study was to explore the factor structure of the Beck Depression Inventory (BDI) with females who participated in a series of laboratory studies dealing with depression, sentence comprehension, and memory. The majority of the few prior factor studies of the BDI, a widely used instrument, have used clinical populations of men and women (Giambra, 1977; Cropley & Weckowicz, 1966; Weckowicz, Muir, & Cropley, 1967; Weckowicz, Yonge, Cropley, & Muir, 1971) usually with high scores (greater than 17) on the instrument. Only one previous study explored the factor structure of the BDI with college students (Berndt, 1979). However, this investigator only reported factor analyses for the 13-item short form of the BDI, whereas the other investigators reported information on the full 21-item scale.

There are several noteworthy deficiencies with the prior research in this area. First, and perhaps foremost, none of the studies analyzed the item data as a function of sex. The only reported analyses were based on mixed samples of men and women. It is important, however, to study sex differences in depression for several reasons. Sex differences are widely recognized in epidemiological studies of depression (e.g., Silverman, 1968; Weissman & Klerman, 1977). And, Hammen and Padesky (1977) have shown that men and women may express depressive responses differently. These differences in responding might result in different factor structures for the BDI. Some evidence exists for this assertion with the BDI. In a factor study of the BDI with Lubin's DACL and Zung's Self-Rating Depression Scale, Giambra (1977) found that sex loaded significantly on the fatigability items of both the BDI and Self-Rating Depression Scale.

Second, none of the investigators have reported more than one factor solution. It

is quite possible that other interpretable solutions could have been observed. In the personality area, Spielberger and his colleagues have shown the desirability of exploring several factor solutions for the Test Anxiety Inventory and State-Trait Anxiety Inventory with adults. Hedl and Papay (1983) have shown this also for the State-Trait Anxiety Inventory for Children.

In the present study, therefore, the BDI items were factor analyzed and multiple solutions were examined for simple structure, parsimony, and psychological meaningfulness. One series of analyses focused on the entire sample of 164 female students. For these it was predicted that one general factor would be observed, one indicating primarily the depth of depression. A secondary series of analyses were computed on the higher scoring (more depressed) students. For these more highly depressed students, multiple factor solutions were expected that might be more congruent with the previous literature dealing with clinically depressed patients.

Method

The total sample consisted of 164 female students (average age = 19.15; average GPA = 2.85) from a private college in a large metropolitan area. The majority of students were freshmen and sophomores who participated in several psychological experiments dealing with affect and sentence memory in which the Beck Depression Inventory (BDI) was administered as part of the experimental protocols and who received course credit for their participation. The breakdown of students by the studies was as follows:

Hedl and Bartlett (1982a)	N = 80
Hedl and Bartlett (1982b)	N = 84

The first paper included two separate, smaller studies bringing the total number of studies included to three.

Beck Depression Inventory

The Beck Depression Inventory is a clinically derived self-report inventory of depression

designed for use in psychiatric populations (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). It was constructed to assess the current depth of depression, whether or not depression is viewed as the primary diagnosis. It consists of 21 items covering affective, cognitive, motivational, and physiological areas of depressive symtomatology. The range of possible scores extends from zero to 63, with scores of 0 - 9 being categorized by Beck as not depressed, 10 - 15 as mildly depressed, 16 - 23 as moderately depressed, and 24 - 63 as severely depressed. Bumberry, Oliver, and McClure (1978) have reported concurrent validity with psychiatric ratings of depression with a college student population. Further, the BDI is a widely used instrument in the study of psychological deficit (e.g., Miller, 1975).

Results

Factor Analyses with the Entire Sample

Intercorrelations were computed among the 21 BDI items (average interitem correlation = .198), and these data were factor analyzed, using a principal axis solution with squared multiple correlations as estimates of the communalities. For the total sample, the number of eigenvalues greater than one was only one. A scree plot (Cattell, 1966) of the eigenvalues, however, suggested that a range of 2-3 factors should be examined as well. Thus, one-, two-, and three-factor solutions were computed and rotated by Kaiser's varimax (1958) and then evaluated in terms of simple structure, parsimony, and psychological meaningfulness. Table 1 presents the varimax factor solutions: the different solutions are indicated across the top of the table with the BDI items and their abbreviations listed in the left column.

Insert Table 1 about here

Inspection of Table 1 (column one) suggests that one general factor of depression best

describes the underlying correlations among the inventory items. The loadings for salient items with an absolute value of .30 or greater are reported in the table. For the one-factor solution, nineteen of the 21 items had salient loadings (> .30). The two items that did not show salient loadings were irritability and weight loss. If an item did not show a salient loading on any factor, its highest loading is given in parentheses.

Inspection of the two- and three-factor solutions also indicates that one general factor is prevalent. Factor 1 showed 13 items and 12 items with salient loadings for the two- and three-factor solutions, respectively. Factor 2 of the two-factor solution showed 10 salient loadings, but four overlapped with factor one as well (a lack of simple structure). Factor 2 of the three-factor solution showed some similarity with factor 2 of the two-factor solution. It showed only five unique items, however. Factor three only showed two items that were unique to it (pessimism, failure).

Secondary Analysis for the Mildly Depressed Students

To explore differences in the factor structure as a function of level of depression, the sample was divided into low and high groups. Highs were defined by a score of 10 or higher on the BDI. From a clinical perspective this "high" group would be viewed as a mildly depressed one with a small number of moderate to severely depressed students (Beck et al., 1961). Table 3 presents information of the distribution of scores for this study.

A similar factor analytic strategy was employed for the subsample of 57 "highly depressed" students. Four eigenvalues were found to be greater than one, but a scree plot of the eigenvalues suggested that a range of solutions be examined. Therefore, a range of 2-5 factor solutions were computed and reviewed as before. Table 2 presents the results of the four-factor solution which was viewed as optimal for this sample of females.

Insert Table 2 about here

Factor 1 showed the following salient items: sadness, social withdrawal, body image, weight loss, somatic preoccupation, and loss of libido. Factor 2 showed the following salient items: pessimism, failure, and fatigue. Negative salient items included crying and irritability. Factor 3 contained the following salient items: dissatisfaction, guilt feelings, punishment, self-dislike, crying spells, self-image, work inhibition. A negative salient loading on weight loss was also seen.

The two-, four-, and five-factor solutions were reviewed and rejected primarily on the basis of lack of simple structure.

Distribution of Depression in the Female College Sample

To determine the relative level of depression in the present sample of females, the distribution of BDI scores was compared to several other studies that were concerned with the epidemiology of depression in college populations. Table 3 presents the percentage of students falling into the four clinical categories used by Beck and his colleagues for the present study. Also included in the table is information gleaned from three epidemiological studies (Bosse et al., 1975; Oliver & Burkham, 1979; Oliver et al., 1976), and two related studies from which some distributional information could be obtained. With the exception of the present study, all others included mixed samples of men and women.

Insert Table 3 about here

Using the chi square goodess-of-fit approach, the present distribution was found to include a larger number of mildly depressed or above students than either a random

sample of freshmen and sophomores at St. Louis University (x^2 = 13.68, $p < .01$, df = 2, Oliver & Burkham, 1979) or random samples from four private, medium sized coed urban universities (x^2 = 7.33, $p < .05$, df = 2, Oliver et al, 1976). To compute these chi squares the frequencies for the moderate and severe categories were combined to insure adequate expected frequencies for the analyses.

Although no analyses were conducted, the two related studies by Hammen (1980) and Hammen and Padesky (1977) indicated approximately 9% of the students in the moderate and severe categories. A higher estimate was reported by Bosse et al. (1975) for a random sample of 158 sophomores.

Discussion

The results of the present study confirm the expectation that when an unselected sample of college females is administered the BDI that one general factor is observed. This finding is consistent with the prior clinical literature that factor analyzed the BDI with an unselected sample of patients (Weckowicz et al., 1967). The best interpretation of this factor was stated in a previous study of the BDI by Cropley and Weckowicz (1966) who concluded that:

> A single, general factor is useful chiefly in indicating the depth of depression, rather than naturally occurring clusters of depressive symptoms which differentiate among depressed patients (p. 20).

Why Berndt (1979) who studied a college sample found some support for three factors which resembled the clinical literature is not obvious. He did, however, use a mixed sample of males and females whereas our data is limited to females only. And second, he only factor analyzed the short-form of the BDI and did not report analyses of the 21-item version as did the current study and previous research on clinical populations.

Using a cutting score of 10 or higher, a secondary analysis suggested that four factors could be interpreted. These factors were not similar to the clinical literature,

however. In the clinical literature one can show the following types of factors: guilty depression, retardation, and self-deprecation. These appear to have some invariance across several studies. Our resultant factor structure was quite different. We did have some suggestion of a "guilty depression" factor, but ours was overladen with sadness, crying spells, indecisiveness, and work inhibition. A second factor which was robust across multiple solutions included a pessimistic outlook, sense of failure, and fatigability.

We also found two other "health" type factors. One was associated with social withdrawal and health concerns (weight loss, hypochondria). The other was associated with a dissatisfaction with body image, loss of appetite, and hypochondria. The appearance of these four factors is probably not unreasonable given the nature of the female student body on the campus from which the data was obtained. The data were obtained from an urban private school with a significant number of students from the middle - upper social classes. In this competitive environment concerns over achievement and self-image are perhaps not unexpected.

The implications of these findings for depression research are at least two-fold. First, research on an unselected college female population may give us some information about any cognitive deficit characteristics associated with depth of depression. But, it may not help with exploring the cognitive deficits associated with varying clusters of symptoms noted in clinical populations. Depue and Monroe (1978) have discussed this particular point in some detail. Miller (1975) in a review of the literature on psychological deficit in depression was pessimistic about showing different cognitive deficit patterns associated with different classifications of depressive symptoms, however. Second, in dealing with this type of population we are primarily studying students with depressed moods in the mild range with a few more severe cases. Thus, if a non-linear relationship holds between level of depression and cognitive performance, our research with

these populations may tend to underestimate the effects of more extreme depth in an unpredictable way.

The data concerning the higher incidence of potential depressive disorders in the current sample must be tempered by several important factors. The current sample only included females whereas the other studies reported data for mixed samples. From prior research we know that females report more disorders of this nature than males in approximately a 2 to 1 ratio by some estimates. Given this situation the non-equivalence of the present sample may be the best explanation for this discrepancy. Additional data is being collected this spring semester on a male population which may shed light on this issue. These male BDI data will be similarly analyzed and compared to the female findings. When this is completed we will have a better idea as to the relation of sex to the factor structure of the BDI with college student populations.

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Footnotes

1. Paper presented at the meeting of the Southwestern Psychological Association, San Antonio, Texas, April 1983. The author wishes to thank Frank Burns for his assistance in collecting and reducing data for analyses in these studies. The author would also like to thank Patsy Moore for typing, editing, and clerical efforts associated with the studies and this manuscript. Requests for copies should be directed to John J. Hedl, Jr., School of Allied Health Sciences, The University of Texas Health Science Center at Dallas, Dallas, Texas, 75235.

2. The item intercorrelation matrix can be obtained from the author upon request. The data were not analyzed by academic year since previous research has shown very little difference in BDI responses as a function of college year when comparing freshman and sophomores.

Table I
Varimax Factor Loadings for One-, Two-, and
Three-Factor Solutions - All Students

BDI Item	Item Description	One-Factor Solution	Two-Factor Solution		Three-Factor Solution		
			I	II	I	II	III
1.	Sadness	.32		.34	.36		
2.	Pessimism	.49	.68				.66
3.	Sense of failure	.39	.58				.68
4.	Dissatisfaction	.60	.46		.52		
5.	Guilty feeling	.57	.41	.41	.60		
6.	Sense of punishment	.56	.41	.38	.48		
7.	Self-dislike	.63	.59		.53		.33
8.	Self-accusations	.32	.32		.33		
9.	Self-punitive wishes	.44	.33		.36		
10.	Crying spells	.41		.38	.42		
11.	Irritability	(.18)					
12.	Social withdrawal	.40		.39		.40	
13.	Indecisiveness	.47	.44			.46	
14.	Body image	.60	.40	.47		.54	.32
15.	Work inhibition	.61	.53	.32	.56		
16.	Sleep disturbance	.42	.39		.40		
17.	Fatigability	.53	.52		.33		.41
18.	Loss of appetite	.45		.40	.35	.30	
19.	Weight loss	(.03)					
20.	Hypochondria	.56		.59		.83	
21.	Loss of libido	.36		.55		.43	
	% Total Variance	64.6		13.3			9.3

Table 2

Varimax Factor Loadings for Females with BDI Scores of 10 or Higher (N = 57)

	BDI Item	Factor I	II	III	IV
1.	Sadness	.52	.68		-.30
2.	Pessimism			.73	
3.	Sense of failure			.51	
4.	Dissatisfaction	.38			.32
5.	Guilty feeling	.59			
6.	Sense of punishment	(.26)			
7.	Self-dislike	.34			
8.	Self-accusations		(-.21)		
9.	Self-punitive wishes				(.29)
10.	Crying spells	.42			
11.	Irritability			-.33	
12.	Social withdrawal		.44		
13.	Indecisiveness	.33			
14.	Body image				.66
15.	Work Inhibition	.35			
16.	Sleep disturbance			(.15)	
17.	Fatigability			.44	
18.	Loss of appetite				.33
19.	Weight loss		.60		
20.	Hypochondria		.45		.65
21.	Loss of libido		.54		
	% Total Variance	31.9	18.7	14.7	12.0

Table 3

Distribution of BDI Scores of the Present Study in Comparison to Previous Studies with College Populations

BDI Score Range		Present Study*	Bosse** et al.(1975)	Hammen (1980)	Hammen & Padesky (1977)	Oliver & Burkham (1979)	Oliver et al. (1976)
0 - 9	Not depressed	65.2%				83%	77%
10 - 15	Mildly depressed	22.6%				13%	16%
16 - 23	Moderately depressed	9.8%	75%	41%	9.25%	3%	6%
24 - 63	Severely depressed	2.4%			9%	1%	1%
	N	164	158	400	2,272	110	560

* Only study that includes females. Since the others included mixed samples, this might explain the higher incidence estimate derived from the present study since females have a higher incidence of psychopathology in general, and depression in particular.

** Used instructions for students to report on any depressive episodes for an entire academic year. This methodology undoubtedly provides the highest estimate of incidence.